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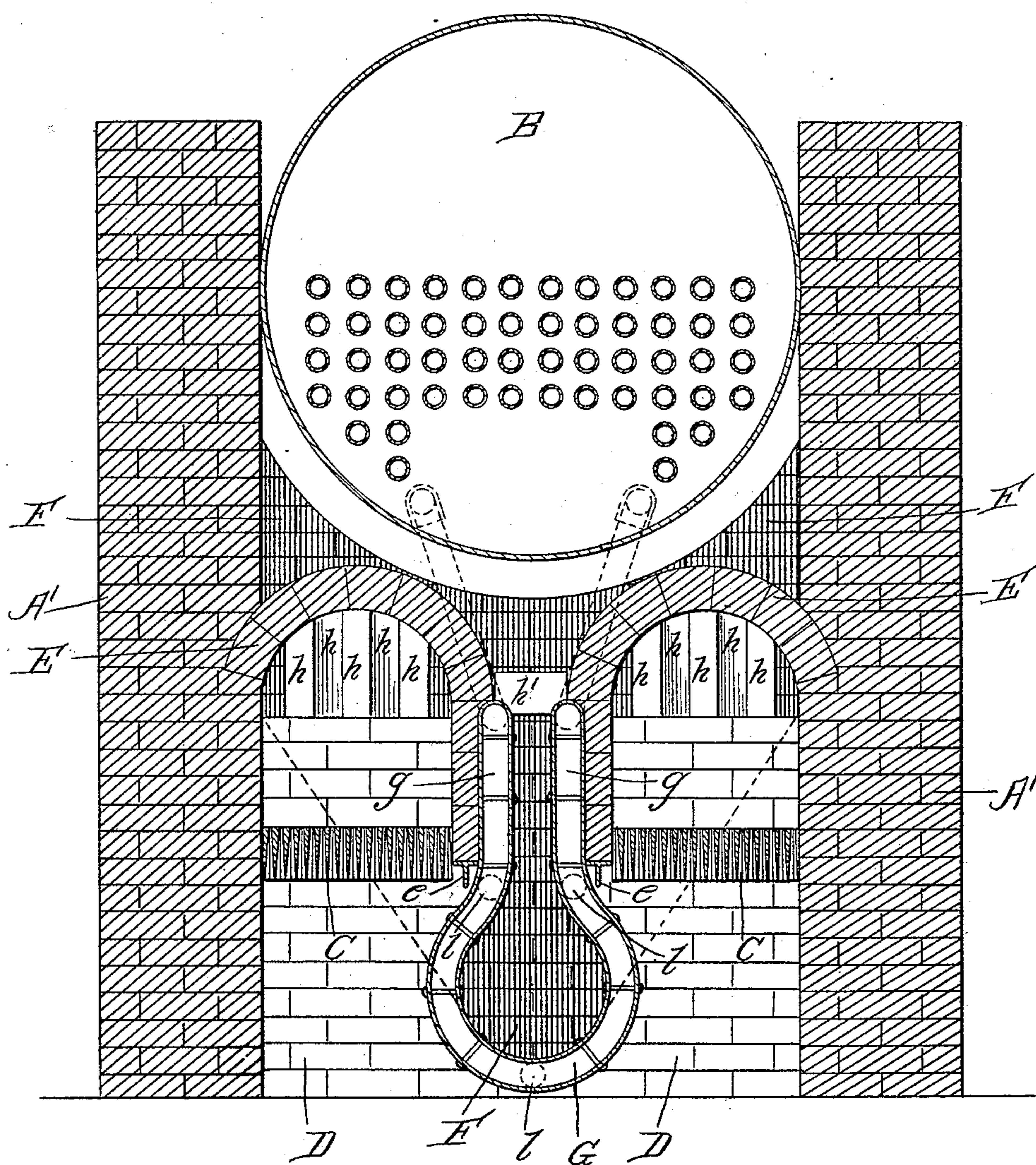
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O. D. ORVIS.
STEAM BOILER FURNACE.

No. 538,274.

Patented Apr. 30, 1895.

Fig. 1.



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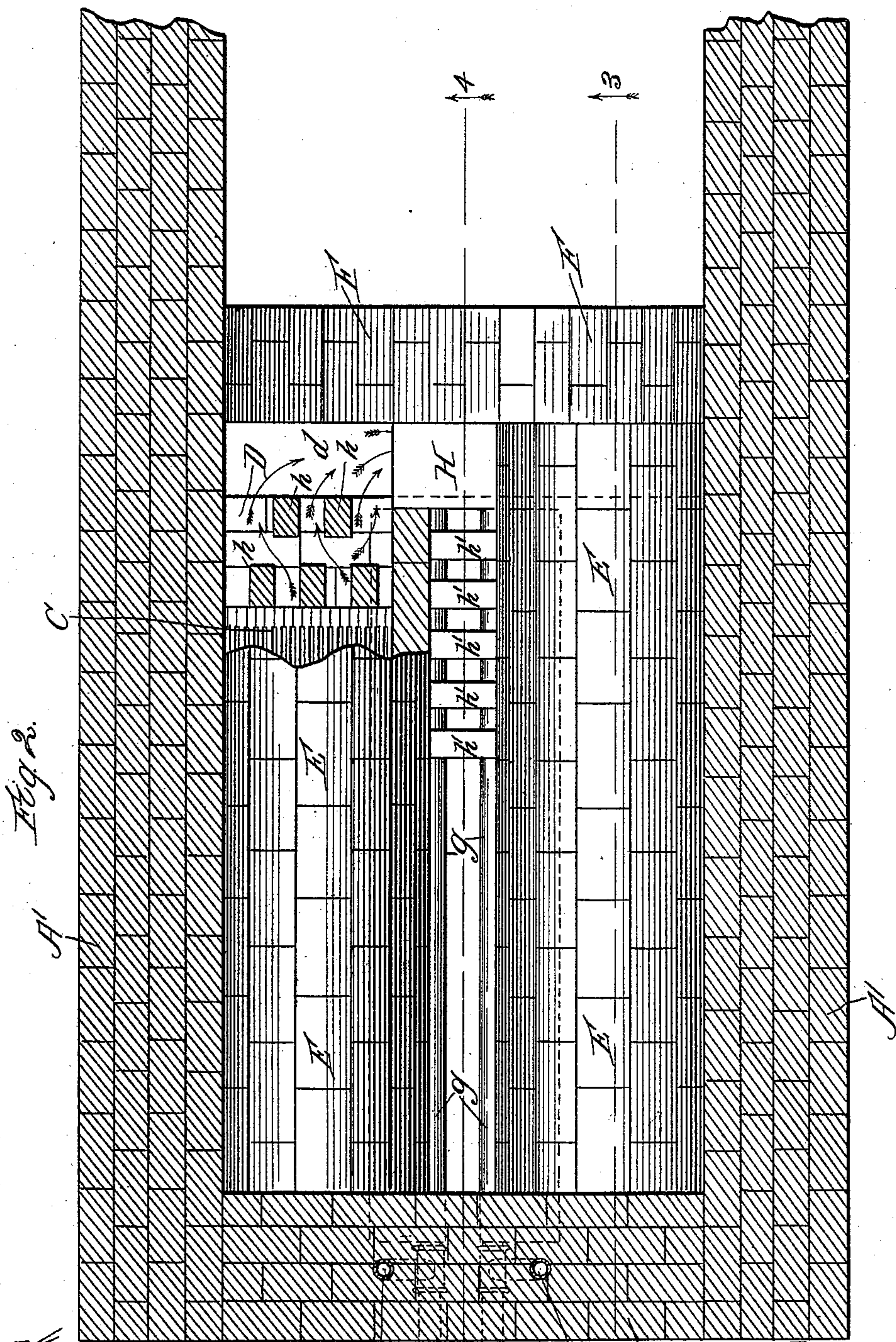
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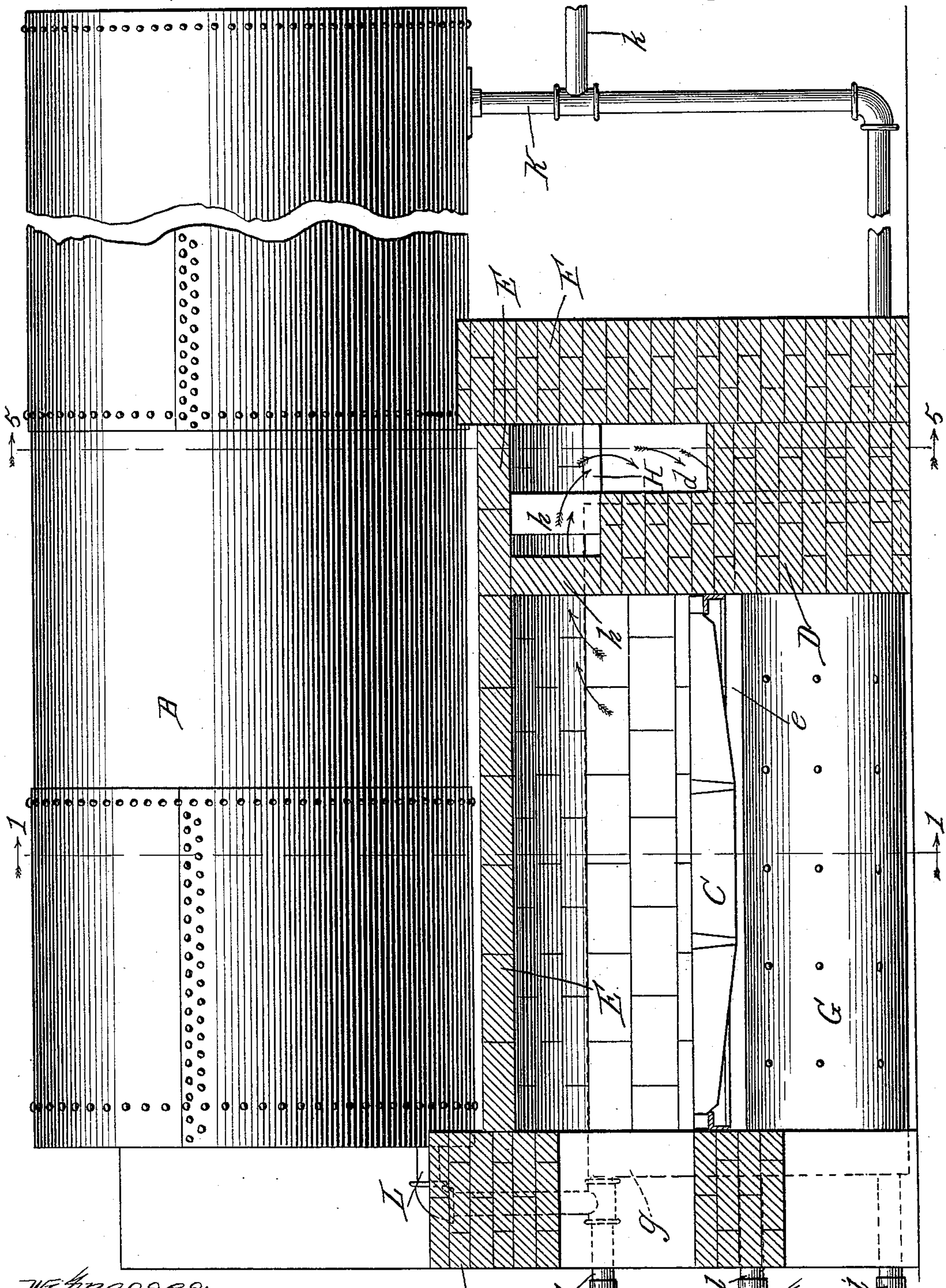
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Fig. 3.

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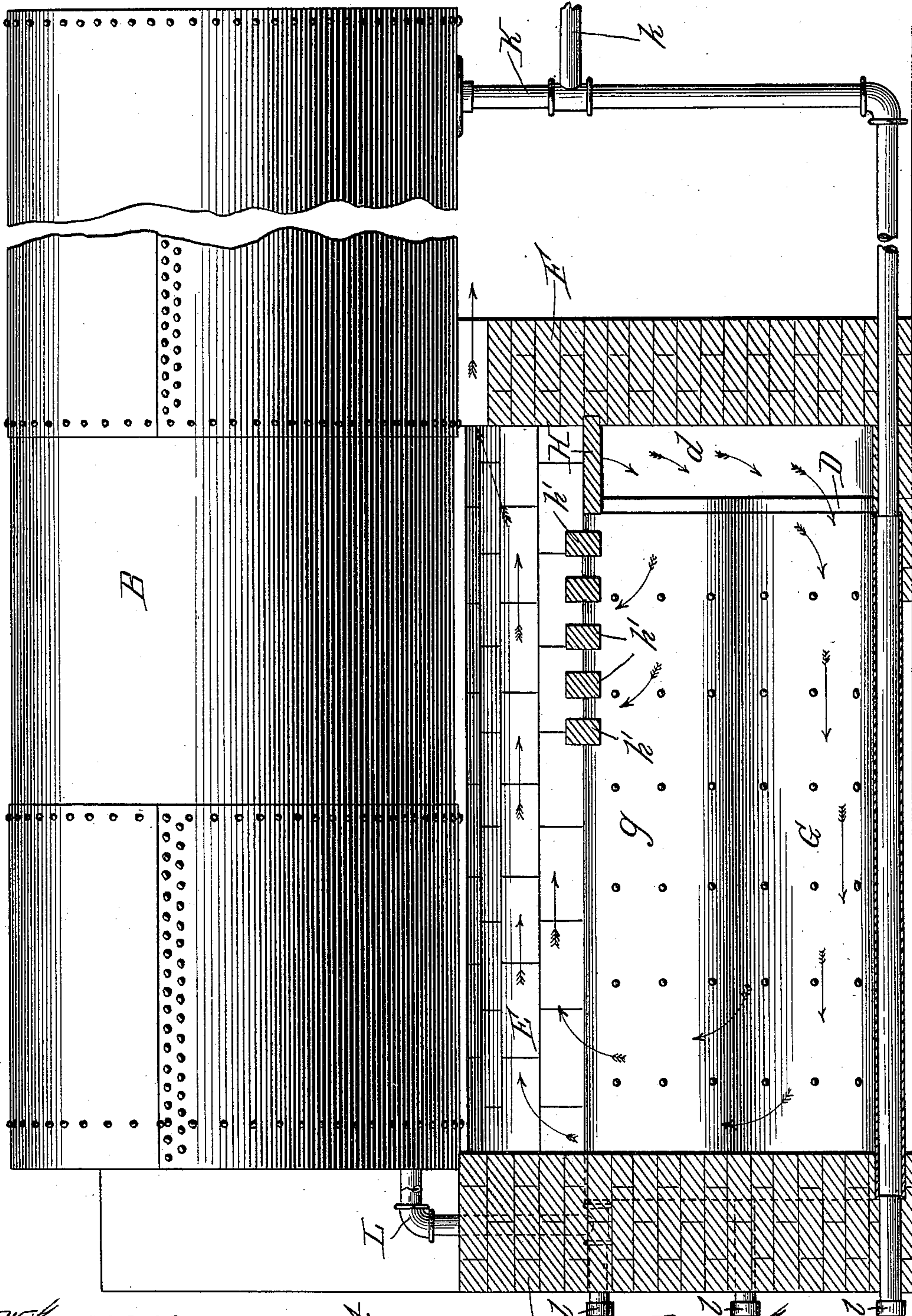
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Fig. 4.

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(No Model.)

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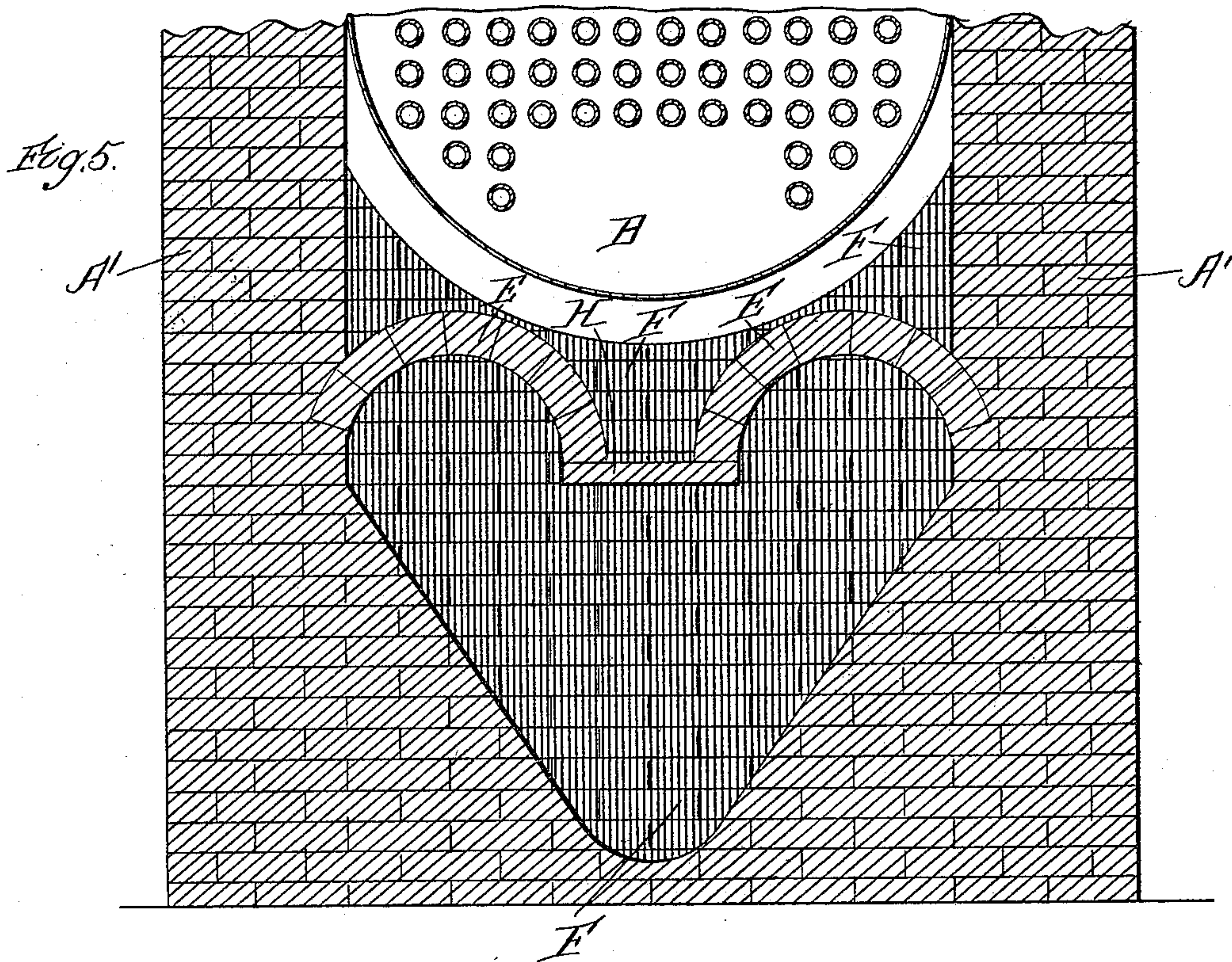
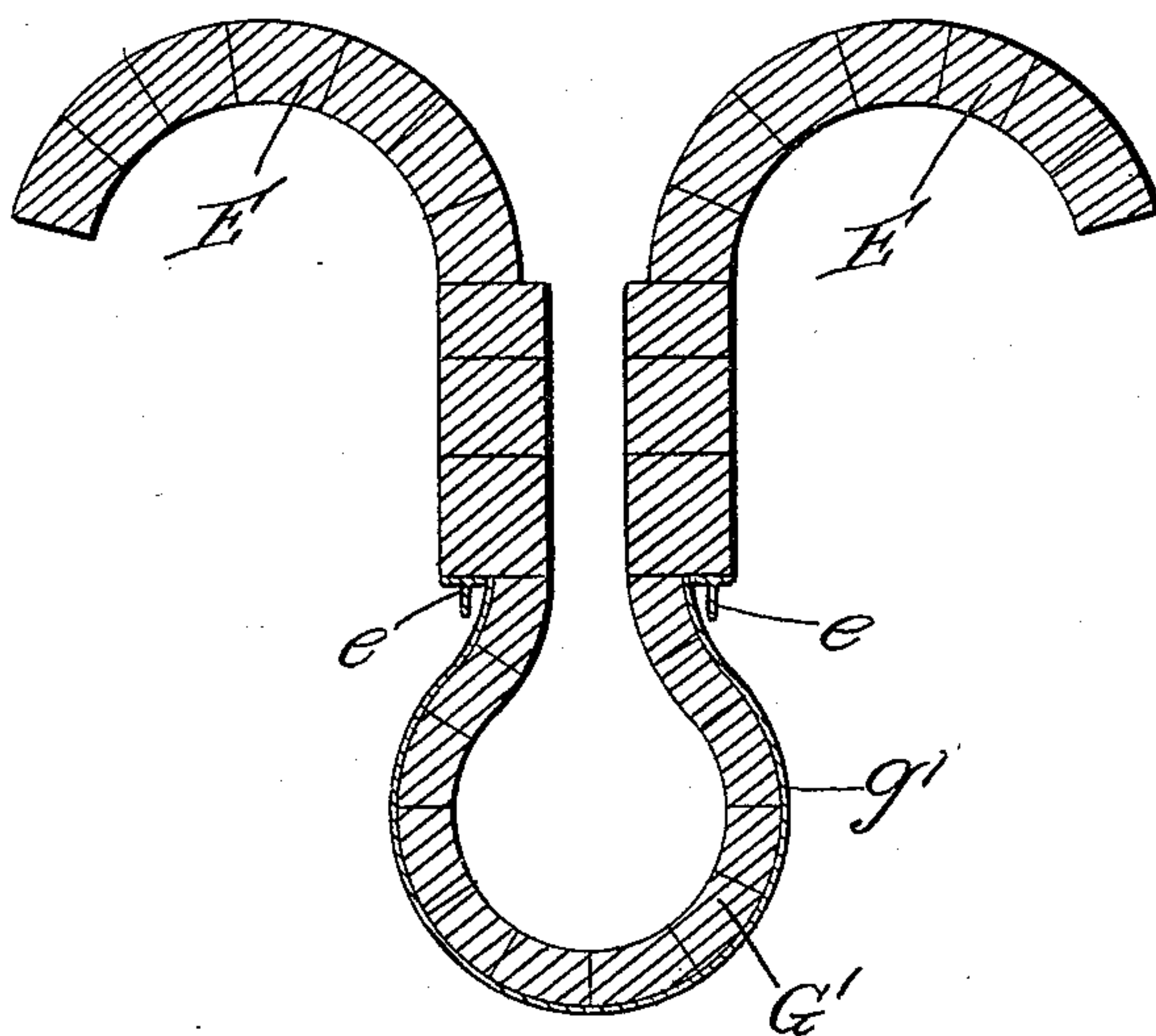


Fig. 6



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UNITED STATES PATENT OFFICE.

OREL D. ORVIS, OF CHICAGO, ILLINOIS.

STEAM-BOILER FURNACE.

SPECIFICATION forming part of Letters Patent No. 538,274, dated April 30, 1895.

Application filed July 16, 1894. Serial No. 517,647. (No model.)

To all whom it may concern:

Be it known that I, OREL D. ORVIS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Steam-Boiler Furnaces; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to steam boiler furnaces. Its object is to economize fuel by securing practically complete combustion; and applying the heat to the boiler surface in such manner as to attain high efficiency in steam production. To secure these results, I use two grates, inclosing each with a low arch from the rear end of which the products of combustion are discharged into a combustion chamber located between two bridge walls and opening to a flue below the level of the grates and extending forwardly and discharging upwardly through a narrow longitudinal aperture directly upon the crown sheet of the boiler.

The invention consists further in various minor details of construction hereinafter fully described.

In the accompanying drawings, Figure 1 is a transverse vertical section on the line 1 1 of Fig. 3. Fig. 2 is a plan section taken immediately below the boiler. Fig. 3 is a longitudinal vertical section on the line 3 3 of Fig. 2, the boiler being in elevation. Fig. 4 is a similar view on the line 4 4 of Fig. 2. Fig. 5 is a transverse vertical section on the line 5 5 of Fig. 3, and Fig. 6 is a transverse vertical section of the flue below the grates showing one form of construction.

Essential to the complete combustion of the inflammable gases set free by the initial combustion of the fuel is the maintenance of a high temperature until the desired result is attained. Contact of the gases with water surfaces must be avoided, and hence the most common construction of smoke-burning furnaces leaves the forward portion of the boiler to be heated through masonry, the gases be-

ing led back through combustion flues until complete inflammation has been accomplished.

In the furnace forming the subject of this application, I have attained complete combustion while throwing the hot vapor resulting therefrom upon the forward end of the boiler, and carrying it thence along its entire length.

I show in the drawings the ordinary front wall, A, and side walls, A', A'. The boiler is represented at B, and the grates at C. Two sets of grates are used and each set is covered by a low brick arch E, extending from the front wall, A, to the bridge wall F, which closes its end and which is located some distance back of the grates. A bridge wall, D, is located immediately back of the grates C, and extends a short distance above them, flue space being provided between it and the arch. Between the two bridge walls, D, F, there is a combustion chamber, *d*, extending downwardly and opening forwardly through the wall, D, into a flue, G, below the level of the grates, and extending forwardly to the front wall, A, and having a narrow longitudinal opening along its upper side through which the products of combustion make their exit, passing upwardly between two arches, E, E, and being delivered directly upon the crown sheet of the boiler, B, and carried back over the bridge wall, F. Upon the top of the wall, D, I place some fire-brick, *h*, spaced apart so that the carbonic oxide circulates among them and they become highly heated. The flue, G, terminates at the rearward side of the wall, D, and a plate, H, closes the space between the two arches, E, E, from that line back to the face of the wall, F, so that the smoke is forced down to the mouth of the flue, G.

The flue, G, is shown in Figs. 1, 2, 3, and 4 as a steel water shell, having its edges, *g*, *g*, upturned and prolonged in parallel planes to the altitude of the bridge wall, D. A service pipe, K, leads from the bottom of the boiler, B, at its rearward end and enters this water shell at its rearward end and at its lowest point. Two return pipes, L, L, lead from the top of the forward end of its upturned edges, *g*, *g*, to the boiler, so that provision is made for free and rapid circulation.

If desired the flue may be of masonry as shown at G', in Fig. 6, and metal sheath, g', may be used to bind it together.

The discharge aperture of the flue, G, is so narrow that the draft is carried throughout its length. To insure this result the rearward portion of this aperture may be closed in part by brick, as h', h', spaced apart.

Combustion is complete in the chamber, d, where the two currents meet directly below the plate, H, so that the temperature within the flue, G, is very high and the development of steam in the water shell forming its walls is very rapid.

The minor features of the furnace shown but not already described are the T-beams, E, running from the wall, A, to the wall, F, for supporting the inner ends of the arches, E, their outer ends being set in the walls, A', A'; the feed pipe, k, entering the service pipe, K, and the pipes, l, l, l, leading forward from the water shell and providing means for cleaning it.

This furnace is of especial value for the consumption of anthracite coal. The low arches, E, E, become highly heated and the inflammation of the carbonic oxide continues, showing a blue flame, from the front of the fire-boxes through the passages over the bridge-wall, D, the inflammable gases being entirely burned before reaching the water surface of the flue, G.

I claim as my invention—

1. In a steam boiler furnace, the combination with the inclosing walls, a pair of grates and with a bridge wall, F, of an arch covering each grate from the front wall of the furnace to the bridge wall, F, and forming therewith a fire box, a flue leading forwardly from the bridge-wall and being in communication with the fire boxes, such flue being located below the fire-boxes and opening upwardly between the arches, substantially as described and for the purpose set forth.

2. In a steam boiler furnace the combination with a pair of inclosed fire-boxes and with a steam boiler located above the fire-

boxes, of a flue located between the fire-boxes and leading from the rearward end thereof and having a discharge opening along its upper side, whereby the products of combustion are delivered against the forward portion of the boiler, substantially as described and for the purpose set forth.

3. In a steam boiler furnace the combination with inclosed fire-boxes, of a masonry inclosed combustion chamber at the rear of the fire-boxes and open thereto, and a flue leading forwardly from such chamber and having a discharge opening along its upper side, substantially as described.

4. In a steam boiler furnace the combination with the boiler, a pair of fire-boxes and their grates, a solid arch inclosing each fire-box, and a bridge-wall, F, closing the rearward end of such arches, of a bridge-wall, D, located forward of the wall F and forming therewith a combustion chamber extending below the level of the grates, and a flue located below the grates and leading forwardly from the combustion chamber and having a discharge opening along its upper side, substantially as described.

5. In a steam boiler furnace the combination with the boiler, a pair of fire-boxes and their grates, a solid arch inclosing each fire-box, and a bridge-wall, F, closing the rearward end of such arches, of a bridge-wall, D, located forward of the wall F and forming therewith a combustion chamber extending below the level of the grates, a flue located below the grates and leading forwardly from the combustion chamber and having a discharge opening along its upper side, the walls of such flue being a water shell, and water pipes connecting such water shell with the boiler, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

OREL D. ORVIS.

Witnesses:

LOUIS K. GILLSON,
SPENCER WARD.